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MICROBIAL CONTAMINATION OF MOBILE PHONES USED BY FOOD VENDORS IN RUMUEME COMMUNITY, PORT HARCOURT, NIGERIA

Ikiriko Chiechefulam Melody*[a], Bealo Deebari Brownson[a], Ayakpo Akpi[b], Lulu Godwin Confidence

Department of Microbiology, Igatius Ajuru University of Education, Rumuolumini, Port Harcourt[a]

Department of Environmental Management, Federal University of Environment and Technology, Ogoni[b].

Department of Environmental Management, Federal University of Environment and Technology, Ogoni[c].

Department of Microbiology, Federal University of Environment and Technology, Ogoni[d]

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***Corresponding Author: Ikiriko Chiechefulam Melody**

Department of Microbiology, Igatius Ajuru University of Education, Rumuolumini, Port Harcourta

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ABSTRACT

Mobile phones have become indispensable communication tools, even among food vendors who prepare and sell ready-to-eat foods. These devices are frequently handled during food preparation and service, potentially serving as reservoirs for pathogenic microorganisms. This study assessed the microbial contamination of mobile phones used by food vendors in Rumueme community, Port Harcourt, Nigeria. A total of 12 mobile phone samples were collected from food vendors across three locations (Rumuchinda, Oroazi, and Mgbuosimini). Standard microbiological techniques were employed to determine total bacterial load, total coliform count, fungal load, and to isolate and identify specific human pathogens including *Staphylococcus aureus*, *Escherichia coli*, and *Salmonella typhi*. Samples were collected using sterile swabs and analyzed using pour plate and spread plate techniques on appropriate media. Total bacterial loads ranged from 1.8×10^3 to 2.0×10^6 CFU/mL, with Mgbuosimini location showing the highest bacterial contamination (3.0×10^6) and Rumuchinda the lowest (1.4×10^6). Coliform bacteria were detected in all locations, with Rumuchinda showing the highest mean count (18.375 MPN/100mL). Fungal contamination ranged from 6.3×10^4 to 1.3×10^6 CFU/mL. The most frequently isolated pathogen was *Staphylococcus aureus* (11 occurrences), followed by *Salmonella typhi* (3 occurrences) and *Escherichia coli* (2 occurrences). Fungal isolates included *Aspergillus niger*, *Aspergillus flavus*, and *Candida* spp.

Mobile phones of food vendors in Rumueme community harbor significant microbial contamination, including potential pathogens. This poses a public health risk through possible cross-contamination to food. Regular decontamination of mobile phones and improved hygiene practices among food vendors are urgently needed.

KEYWORDS: Microbial contamination, mobile phones, food vendors, pathogens, food safety, Port Harcourt.

1.1 INTRODUCTION

Mobile phones have evolved from luxury items to essential daily necessities, transforming virtually every sector of human activity including communication, banking, education, entertainment, healthcare, and business (Karen, 2019). In Nigeria, as in many developing nations, mobile phone penetration has increased dramatically, with devices becoming indispensable tools even for informal sector workers such as food vendors. These vendors rely on mobile phones for business communication, receiving orders, and coordinating with suppliers while simultaneously preparing and selling ready-to-eat foods to the public.

The ubiquitous nature of mobile phones and their constant handling create ideal conditions for microbial colonization. The heat generated during phone use, combined with frequent contact with hands, surfaces, and various environments, contributes to the multiplication of microorganisms on phone surfaces. Research has demonstrated that mobile phones can harbor more bacteria than toilet seats, public door handles, and shoe soles (Taher, 2019; Ekrakene & Igeleke, 2012). Mobile phones accompany users throughout their daily activities, coming into contact with numerous surfaces including tables, utensils, food items, and personal belongings, potentially accumulating pathogenic microorganisms (Arora et al., 2009).

Food vending has become increasingly important in Nigeria's economy, providing employment and affordable meals to urban populations. However, the microbiological safety of street-vended foods remains a significant concern. Food vendors often operate in environments with inadequate sanitation, limited access to clean water, and insufficient knowledge of hygiene practices (Akinyemi et al., 2013; Nurudeen, 2014). The combination of poor hygiene practices and the widespread use of mobile phones during food handling creates a potential pathway for foodborne disease transmission.

Foodborne diseases represent a critical public health challenge globally, with the World Health Organization (WHO) estimating 600 million foodborne illnesses and 420,000 deaths annually. In developing countries, the burden is disproportionately high, particularly affecting vulnerable populations including children, the elderly, and immunocompromised individuals (WHO, 2015). Common foodborne pathogens include *Salmonella* spp., *Escherichia coli*, *Staphylococcus aureus*, and various fungal species that can cause illnesses ranging from mild gastroenteritis to life-threatening systemic infections.

Several studies have documented microbial contamination of mobile phones in various settings, including healthcare facilities, educational institutions, and general populations (Amala & Ejikema, 2015; Pal et al., 2015; EL-Kady, 2017). However, limited research has focused specifically on mobile phones used by food vendors, particularly in the Nigerian context. The constant handling of phones during food preparation and service, combined with the high temperatures and humidity typical of Nigerian environments, may create conditions conducive to microbial growth and transmission.

Given the potential public health implications, this study aimed to assess the microbial contamination of mobile phones used by food vendors in Rumueme community, Port Harcourt, Nigeria. The specific objectives were to: determine the bacterial load on mobile phones of food vendors; assess total coliform bacteria present; determine fungal load; and isolate and identify specific human pathogens (*Staphylococcus aureus*, *Salmonella typhi*, and *Escherichia coli*) contaminating these devices.

2.0 Literature Review

Historical Development and Usage of Mobile Phones

Mobile phone technology has undergone remarkable evolution since the first demonstration of handheld cellular phones by John F. Mitchell and Martin Cooper in 1973 (Krizanovic, 2021). The launch of the first commercial cellular network in Japan in 1979 marked the beginning of mobile communication. The development progressed from bulky devices weighing 800g to today's sophisticated smartphones with multifunctional capabilities. Significant milestones include the introduction of 2G networks in 1992, the first camera phone in 1999, the first iPhone in 2007, and the advent of 5G technology in 2019 (Krizanovic, 2021).

Currently, Africa has over 650 million mobile phone users, with 495 million subscribers to mobile services by the end of 2020, representing 46% of the region's population (World Bank, 2020). This widespread adoption has transformed mobile phones from simple communication devices into essential tools that combine features including cameras, wallets, alarm clocks, calendars, internet access, email, and MP3 players. The constant handling and multi-functionality of these devices expose them to various sources of contamination.

Microbial Contamination of Mobile Phones

Mobile phones serve as potential reservoirs for microorganisms due to their frequent handling and the warm environment they provide (Brady et al., 2006; Kilic et al., 2009). The combination of constant handling and heat generated during use creates a prime breeding ground for various microorganisms (Taher, 2019). Studies have identified numerous microorganisms on mobile phones, including bacteria such as *Staphylococcus aureus*, coagulase-negative staphylococci, *Escherichia coli*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, and fungi including *Aspergillus* spp., *Penicillium* spp., and *Candida* spp. (Amala & Ejikema, 2015; Ilusanya et al., 2012; Pal et al., 2015).

The contamination of mobile phones occurs through multiple routes: direct contact with hands, exposure to environmental surfaces, sharing between users, and proximity to contaminated body sites during calls (Mark et al., 2014). Factors influencing contamination levels include frequency of usage, personal hygiene practices, phone handling habits, storage locations (pockets, bags, surfaces), and environmental conditions (Zakai et al., 2016; Bodena et al., 2019).

Food Vending Practices and Hygiene

Street food vending addresses critical social and economic needs in developing countries, providing employment and accessible nutrition to urban populations (Neubauer et al., 2013). However, the sector faces significant hygiene challenges. Studies in Nigeria have documented inadequate practices including: failure to properly wash raw foods (73.6%), preparation on uncleaned surfaces (84.5%), use of bare hands for serving (68.2%), handling money while serving (86.5%), and lack of proper waste disposal (Nurudeen, 2014; Akinyemi et al., 2013).

The hygiene practices of food vendors are influenced by various factors including education level, training, access to clean water, availability of sanitation facilities, and economic constraints. Studies have shown that food handlers often possess inadequate knowledge of food safety principles despite positive attitudes toward hygiene (Campos et al., 2012). The lack of formal training in food safety is particularly concerning, with Nurudeen (2014) finding that only 2.7% of food vendors had formal training on food preparation.

Pathogenic Microorganisms in Food Vending Environments

The microorganisms isolated from food vendors' mobile phones represent significant foodborne pathogens. *Staphylococcus aureus* is a common inhabitant of human skin and nasal passages, capable of causing conditions ranging from minor skin infections to life-threatening pneumonia and meningitis. Its presence on mobile phones indicates poor hand hygiene practices (Ilusanya et al., 2012).

Salmonella typhi, the causative agent of typhoid fever, is transmitted through the fecal-oral route and can survive in various environments. Contamination of mobile phones with *Salmonella* suggests inadequate hand washing after toilet use and potential for cross-contamination to food (Winfield & Groisman, 2005). The infectious dose is low, with as few as 15-20 cells capable of causing disease (Campos et al., 2012).

Escherichia coli is a significant cause of diarrhea in developing countries. Pathogenic strains can cause severe illness, and their presence on mobile phones indicates fecal contamination (Thidarat et al., 2011). E. coli is normally absent from hands and its detection provides strong evidence of poor hygiene practices.

Fungal contamination of mobile phones poses additional health risks, particularly for immunocompromised individuals. *Aspergillus* spp. can cause respiratory infections and allergic asthma, while *Candida* spp. can cause opportunistic infections (Pitt & Hocking, 2009; Tomsikova, 2002). The humid and warm conditions in tropical environments like Nigeria favor fungal growth on mobile phones.

3.0 MATERIALS AND METHODS

Study Area

The study was conducted in Rumueme community, Obio/Akpor Local Government Area, Rivers State, Nigeria. Rumueme is located in the heart of Port Harcourt, sharing boundaries with Rumuola community and the Government Reserved Area. The community has a mix of residential and commercial activities, including numerous food vending establishments.

Sample Collection

A total of 12 mobile phone samples were collected from food vendors across three locations within Rumueme: Rumuchinda (4 samples), Oroazi (4 samples), and Mgbuosimini (4 samples). Samples were collected over a three-month period using sterile swabs moistened with sterile peptone water. The entire surface of each mobile phone (including screen, keypad, and edges) was swabbed using a standardized technique. Swabs were immediately placed in sterile containers and transported to the laboratory within 2 hours for analysis.

Determination of Total Bacterial Load

Media and Preparation: Nutrient Agar (NA) was prepared according to manufacturer's instructions: 28g of NA powder was dissolved in 1 liter of distilled water, sterilized by autoclaving at 121°C for 15 minutes, and poured into sterile petri dishes.

Procedure: Each swab sample was stirred vigorously in 100mL of sterile distilled water in a 250mL flask to create a sample stock. Serial dilutions (10^{-1} to 10^{-4}) were prepared in test tubes containing 9mL of sterile water. Using a sterile graduated pipette, 0.5mL from 10^{-3} and 10^{-4} dilutions was transferred to melted nutrient agar, mixed, and poured into petri dishes. Plates were incubated at 37°C for 24 hours, and colonies were counted using a hand lens. Total heterotrophic bacterial count was calculated as colony-forming units (CFU) per mL. The formula used was:

Average total bacteria = $[(2NC_3 \times 10^3) + (2NC_4 \times 10^4)] / 2$ CFU/mL

Where NC_3 and NC_4 represent colony counts from 10^{-3} and 10^{-4} dilutions, respectively.

Determination of Total Coliform Bacteria

Presumptive Test (Most Probable Number): MacConkey broth was prepared (5g in 125mL distilled water) and dispensed into tubes containing inverted Durham tubes. Sample volumes of 50mL and 10mL were added to MacConkey broth and incubated at 44°C for 24 hours. Tubes showing acid production (color change from purple to yellow) and gas production in Durham tubes were considered positive for coliform bacteria.

Confirmed Test: Positive tubes from the presumptive test were streaked onto Endo agar plates and incubated at 35°C for 24 hours. Colonies appearing red were considered confirmed coliforms.

Completed Test: Confirmed colonies were transferred to nutrient agar slants and lactose broth, incubated at 35°C for 24 hours, and examined microscopically. Short, Gram-negative, non-spore-forming rods were considered positive for coliform bacteria.

Determination of Fungal Load

Media and Preparation: Potato Dextrose Agar (PDA) was prepared (39g in 1 liter distilled water), autoclaved at 121°C for 15 minutes, cooled to 45°C, and dispensed into sterile petri dishes.

Procedure: Serial dilutions (10^{-1} to 10^{-4}) of the sample stock were prepared. From 10^{-3} and 10^{-4} dilutions, 0.1mL was transferred to melted PDA, mixed, and poured into plates. Plates were incubated at 37°C for 24 hours, and fungal colonies were counted. Total fungal load was calculated as:

Average total fungi = $[(10FC_3 \times 10^3) + (10FC_4 \times 10^4)] / 2$ CFU/mL

Where FC_3 and FC_4 represent fungal colony counts from 10^{-3} and 10^{-4} dilutions, respectively.

Isolation and Identification of Human Pathogens

Staphylococcus aureus: Samples were inoculated onto Blood Agar and incubated at 37°C for 24 hours. Suspect colonies were subcultured onto Mannitol Salt Agar (MSA). Yellow colonies on MSA (mannitol fermenters) were subjected to biochemical tests including catalase test (positive), coagulase test (positive), and DNase test (positive). Gram staining was performed to confirm Gram-positive cocci in clusters.

Escherichia coli: Samples were inoculated onto MacConkey Agar and incubated at 37°C for 24 hours. Pink colonies were subcultured onto Blood Agar. Isolates were identified by Gram staining (Gram-negative rods), indole test (positive), β-glucuronidase test (positive), and citrate utilization test (negative).

Salmonella typhi: Samples were inoculated onto Blood Agar, then suspect colonies were streaked onto Salmonella-Shigella (SS) Agar and incubated at 35°C for 24 hours. Pink-red colonies with black centers (H_2S production) were subjected to biochemical tests including Kligler Iron Agar (KIA) test (alkaline slant, acid butt, H_2S production), urease test (negative), and citrate test (negative). Gram staining confirmed Gram-negative rods.

All isolates were purified and stored on nutrient agar slants at 4°C for further analysis.

4.0 RESULTS

Bacterial Load on Mobile Phone Surfaces

The total bacterial load on mobile phone surfaces of food vendors varied across the three locations (Table 4.1). Mgbuosimini location had the highest bacterial count with a total of 3.0×10^6 CFU/mL, followed by Oroazi with 2.5×10^6 CFU/mL, and Rumuchinda with the lowest count of 1.4×10^6 CFU/mL. Individual sample counts ranged from 1.8×10^3 to 2.0×10^6 CFU/mL.

Table 4.1: Bacterial Load on Mobile Phone Surfaces of Food Vendors.

Samples	Rumuchinda	Oroazi	Mgbuosimini	Total
1	4.4×10^3	1.0×10^5	2.0×10^6	3.0×10^5
2	1.0×10^6	9.0×10^5	2.1×10^5	2.1×10^6
3	2.0×10^5	7.6×10^5	7.7×10^5	1.7×10^6
4	1.8×10^5	8.0×10^5	1.8×10^3	9.8×10^5
Total	**1.4×10^6**	**2.5×10^6**	**3.0×10^6**	

Total Coliform Bacteria

The total coliform bacteria present on mobile phone surfaces is presented in Table 4.2. Rumuchinda location showed the highest coliform bacterial count with a grand mean of 18.375 MPN/100mL, followed by Oroazi with a grand mean of 16.2 MPN/100mL, and Mgbuosimini with the lowest grand mean of 13.375 MPN/100mL. Individual sample ranges varied, with the highest range (7-63) observed in Rumuchinda sample 4.

Table 4.2: Total Coliform Bacteria on Mobile Phone Surfaces.

Sample	Rumuchinda (Mean)	Oroazi (Mean)	Mgbuosimini (Mean)
1	1-17 (9)	2-25 (13.5)	1-17 (19)
2	4-35 (19.5)	2-21 (11.5)	3-28 (15.5)
3	1-19 (10)	5-47 (26.5)	4-34 (19)
4	7-63 (35)	2-25 (13.8)	1-19 (10)
Grand Mean	**18.375**	**16.2**	**13.375**

Note: Figures in brackets represent mean of the range; MPN per 100mL

Fungal Load on Mobile Phone Surfaces

Fungal contamination showed considerable variation (Table 4.3). Mgbuosimini location had the highest total fungal load (1.3×10^6 CFU/mL), followed by Rumuchinda (1.5×10^5

CFU/mL), and Oroazi with the lowest total fungal load (6.3×10^4 CFU/mL). Two samples (Rumuchinda sample 2 and Mgbuosimini sample 1) showed the highest individual counts of 1.0×10^6 CFU/mL each.

Table 4.3: Fungal Load on Mobile Phone Surfaces.

Samples	Rumuchinda	Oroazi	Mgbuosimini	Total
1	1.0×10^5	0	0	1.0×10^5
2	0	2.0×10^4	1.0×10^6	1.0×10^6
3	0	0	0	0
4	5.0×10^4	4.3×10^4	3.7×10^5	4.6×10^5
Total	$\mathbf{1.5\times10^5}$	$\mathbf{6.3\times10^4}$	$\mathbf{1.3\times10^6}$	

Human Pathogens on Mobile Phone Surfaces

The isolation and identification of specific human pathogens revealed *Staphylococcus aureus* as the most frequently isolated organism with 11 occurrences (Table 4.4). *Salmonella typhi* was isolated from 3 samples (one from each location), while *Escherichia coli* was found in 2 samples (one from Oroazi and one from Mgbuosimini). Oroazi and Mgbuosimini locations had the highest total pathogen counts with 6 occurrences each.

Table 4.4: Human Pathogens on Mobile Phone Surfaces

Pathogens Isolated	Rumuchinda	Oroazi	Mgbuosimini	Total
Salmonella typhi	1	1	1	3
Escherichia coli	-	1	1	2
Staphylococcus aureus	3	4	4	11
Total	**4**	**6**	**6**	

5.0 DISCUSSION

The results of this study demonstrate significant microbial contamination of mobile phones used by food vendors in Rumueme community. The bacterial loads observed (1.8×10^3 to 2.0×10^6 CFU/mL) are comparable to findings from other Nigerian studies. Ilusanya et al.

(2012) reported 100% contamination rates among food vendors' mobile phones in Ago-Iwoye, Ogun State, while Akinyemi et al. (2013) found food vendors' phones had the highest bacterial isolates among various phone users.

The variation in bacterial contamination levels across locations (Mgbuosimini > Oroazi > Rumuchinda) likely reflects differences in hygiene practices and environmental conditions. Mgbuosimini's higher contamination rate may be associated with the presence of a river in the area where waste disposal and defecation activities occur, creating conditions for fecal contamination. This is consistent with findings that environmental factors significantly influence microbial contamination levels (Kawo & Rogo, 2008; Enemuor et al., 2012a; 2012b).

The high coliform bacteria counts detected, particularly in Rumuchinda (grand mean 18.375 MPN/100mL), indicate inadequate sanitary practices among food vendors. Coliform bacteria serve as indicators of fecal contamination and poor hygiene (Campos et al., 2012). The presence of coliforms suggests that food vendors may not be practicing adequate hand washing after toilet use, allowing transfer of fecal bacteria to their mobile phones. This is concerning as coliforms, particularly E. coli, can cause foodborne illness when transferred to food products.

The fungal contamination levels (6.3×10^4 to 1.3×10^6 CFU/mL) demonstrate that mobile phones support fungal growth, with Aspergillus spp. and Candida spp. identified among the isolates. These findings are consistent with studies documenting fungal contamination of mobile phones (Kurli et al., 2018; Pitt & Hocking, 2009). The high fungal loads in Mgbuosimini may be associated with the tropical climate of Port Harcourt, which provides optimal conditions (high humidity and temperature) for fungal growth (WHO, 2009; Eduard, 2009). Fungal spores can cause respiratory infections and allergic reactions, particularly in immunocompromised individuals.

The predominance of *Staphylococcus aureus* among isolated pathogens (11 of 16 occurrences) reflects the organism's status as a common skin commensal and its easy transfer through hand-to-phone contact. This finding aligns with previous studies that identified S. aureus as the most frequent isolate from mobile phones (Brady et al., 2006; Kilic et al., 2009; Pal et al., 2015). The presence of S. aureus on mobile phones of food vendors indicates poor hand hygiene practices, as this organism is readily transferred from skin to surfaces.

The detection of *Salmonella typhi* (3 occurrences) and *Escherichia coli* (2 occurrences) on food vendors' mobile phones is particularly significant from a public health perspective. These organisms indicate fecal contamination and poor hygiene practices. The presence of S.

typhi suggests potential for typhoid fever transmission, while E. coli indicates enteric contamination. These findings are consistent with the study by Akinyemi et al. (2009), which reported that food vendors and marketers had the highest contamination rates with Enterobacteriaceae members.

The absence of E. coli in Rumuchinda samples despite higher coliform counts may indicate that the coliform contamination primarily consists of non-fecal environmental strains rather than fecal E. coli. Alternatively, it may reflect the limits of detection in this small sample. The presence of S. typhi in all three locations suggests widespread inadequate hygiene practices across the study area.

The contamination patterns observed can be attributed to multiple factors. Most food vendors were observed handling money and serving food simultaneously, creating opportunities for cross-contamination between phones, hands, money, and food. This is consistent with Nurudeen's (2014) finding that 86.5% of food vendors handled money while serving food. The storage of phones in pockets and handbags, which may contain various contaminants, also contributes to contamination (Zakai et al., 2016). Additionally, the lack of regular phone cleaning and disinfecting allows microbial populations to persist and proliferate.

The public health implications of these findings are substantial. Food vendors' mobile phones can serve as vehicles for transmitting pathogenic microorganisms to ready-to-eat foods, potentially causing foodborne illness outbreaks. The presence of multiple pathogens, including those capable of causing typhoid fever, staphylococcal food poisoning, and diarrheal diseases, underscores the need for interventions to reduce contamination levels.

The study has several limitations, including the small sample size (12 phones) and the cross-sectional design, which cannot establish causality or temporal trends. Additionally, while the study identified the presence of pathogens, it did not assess their viability or ability to cause infection. Future studies should include larger sample sizes, assess the viability of isolated organisms, and investigate the effectiveness of various disinfection methods.

Public Health Implications

The findings of this study have significant public health implications for food safety and disease prevention in Nigeria and similar developing countries.

Food Safety and Foodborne Disease Risk

The presence of pathogenic microorganisms on food vendors' mobile phones represents a direct threat to food safety. Food vendors handle their phones frequently during food preparation and service, providing numerous opportunities for cross-contamination. The detection of S. aureus, S. typhi, and E. coli on these devices suggests potential for transmission of these organisms to ready-to-eat foods. Given the low infectious doses of some pathogens (e.g., as few as 10 cells of Shigella can cause infection), even minimal contamination could lead to foodborne illness outbreaks.

Need for Public Health Education

The study highlights the urgent need for public health education targeting food vendors. Education programs should emphasize the importance of personal hygiene, including regular hand washing with soap and water, particularly after using the toilet and before handling food. Vendors should also be educated about the potential role of mobile phones in cross-contamination and be encouraged to clean their phones regularly with appropriate disinfectants. Training programs should address the full range of hygiene practices, including proper food handling, environmental sanitation, and waste management.

Policy and Regulatory Implications

Regulatory bodies such as the National Agency for Food and Drug Administration and Control (NAFDAC) should consider including mobile phone hygiene in food safety regulations. Specific recommendations could include:

- Mandating that food vendors not handle mobile phones during food preparation and service
- Requiring regular decontamination of mobile phones with alcohol-based disinfectants
- Including mobile phone hygiene in food safety inspection checklists
- Implementing enforcement mechanisms and penalties for non-compliance

Healthcare System Implications

The high levels of microbial contamination on food vendors' phones suggest an increased risk of foodborne disease outbreaks, which could strain healthcare systems. Healthcare providers should be aware of the potential role of mobile phones in transmitting foodborne pathogens and consider this in patient education and clinical care. Hospitals and health centers could serve as educational venues for food vendors and the general public regarding food safety and hygiene.

Economic Implications

Foodborne diseases impose significant economic burdens, including healthcare costs, lost productivity, and reduced quality of life. By addressing contamination of mobile phones used by food vendors, substantial economic savings could be achieved. Additionally, improved food safety practices could enhance the reputation of street food vendors and potentially increase their business viability by building consumer trust.

Research Implications

This study identifies several areas requiring further research:

- Longitudinal studies to assess seasonal variations in contamination levels
- Intervention studies to evaluate effectiveness of various cleaning and disinfection methods
- Studies linking contamination of food vendors' phones to actual foodborne illness outbreaks
- Economic analyses of the costs and benefits of implementing mobile phone hygiene programs
- Assessment of knowledge, attitudes, and practices regarding mobile phone hygiene among food vendors

Recommendations for Action

Based on the study findings, the following public health actions are recommended:

1. **Immediate:** Develop and distribute educational materials for food vendors on the importance of mobile phone hygiene, including posters and illustrated guides in local languages
2. **Short-term:** Conduct training workshops for food vendors on comprehensive food safety practices, including proper hand hygiene and phone decontamination
3. **Medium-term:** Work with regulatory bodies to develop and implement standards for mobile phone hygiene in food establishments
4. **Long-term:** Establish surveillance systems to monitor contamination levels and evaluate the effectiveness of interventions
5. **Ongoing:** Support research on cost-effective strategies for reducing microbial contamination of mobile phones in food vending settings

6.0 CONCLUSION

This study demonstrates that mobile phones used by food vendors in Rumueme community, Port Harcourt, are significantly contaminated with bacteria and fungi, including potential human pathogens. Bacterial loads ranged from 1.8×10^3 to 2.0×10^6 CFU/mL, with Mgbuosimini location showing the highest contamination levels. Coliform bacteria were detected in all locations, indicating fecal contamination and poor hygiene practices. Fungal contamination was also substantial, with Aspergillus spp. and Candida spp. identified. Among the human pathogens isolated, Staphylococcus aureus was most prevalent, followed by Salmonella typhi and Escherichia coli.

The findings highlight the potential of food vendors' mobile phones to serve as vehicles for transmitting pathogenic microorganisms to food, posing significant public health risks. The contamination likely results from poor personal hygiene practices, including inadequate hand washing, handling of money while serving food, and lack of regular phone cleaning. These risks are compounded by environmental factors such as inadequate sanitation facilities and limited access to clean water.

Effective intervention strategies are urgently needed to address this public health concern. These should include public health education programs targeting food vendors, implementation of hygiene regulations, development of policies promoting mobile phone decontamination, and continuous monitoring and enforcement. Such interventions could significantly reduce the risk of foodborne disease transmission through contaminated mobile phones and improve overall food safety in street vending establishments.

The study contributes to the growing body of evidence on the public health risks associated with mobile phone contamination, particularly in food handling settings. It underscores the need for integrated approaches to food safety that consider all potential transmission routes, including emerging vehicles such as mobile phones. Future research should focus on developing and evaluating cost-effective interventions and assessing their impact on food safety outcomes.

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